

## SECTION 33 3200

### WASTEWATER UTILITY PUMPING STATIONS

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#### LANL MASTER SPECIFICATION

When editing to suit project, author shall add job-specific requirements and delete only those portions that in no way apply to the activity (e.g., a component that does not apply). To seek a variance from applicable requirements, contact the Engineering Standards Civil POC.

When assembling a specification package, include applicable specifications from all Divisions, especially Division 1, General Requirements.

Delete information within "stars" during editing.

This specification is intended for multiple or large (e.g., Line Item) buildings. Single GPP-type building should install a small interior station.

Coordinate this Specification with Civil Standard Drawings ST-G3020-2, Exterior Sewage Lift Station.

Specification developed for ML-3 / ML-4 projects. For ML-1/ML-2, additional requirements and QA reviews are required.

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#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Submersible pumps and equipment for sanitary sewer lift station.

##### 1.2 LANL PERFORMED WORK

- A. LANL's Support Services Subcontractor will perform acceptance inspection, testing, adjusting and tie-in of lift station. See PART 3.

##### 1.3 SUBMITTALS

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The LANL Utilities Group Wastewater Representative shall approve design, location, and submittals of sewage lift station.

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- A. Submit the following in accordance with Section 01 3300, Submittal Procedures:
  - 1. Catalog data.
  - 2. Power and Control Cables.
  - 3. Pump curves.

4. Operation and maintenance data.
  - a. Theory of operation.
  - b. Test procedure.
5. Warranties.

#### 1.4 WARRANTY

- A. Manufacturer's printed warranties shall apply to pumps.
- B. Provide five years or 10,000 elapsed-time hours warranty after installation, including parts and labor.
- C. Provide for repairs to be performed at the manufacturer's authorized warranty repair station located within a 200 mile radius of this Project.

#### 1.5 QUALITY ASSURANCE

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Items available with NRTL label must be NRTL listed. Refer to ESM Chapter 7, Section D5000, paragraph 5.10 and also LANL Electrical Safety LIR 402-600-01.3 paragraph 5.9.

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- A. Provide Nationally Recognized Testing Laboratory (NRTL) listed material and equipment for the application and environment in which installed.
- B. Install electrical motors, equipment, and wiring in accordance with the National Electrical Code.

### PART 2 PRODUCTS

#### 2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Alternate products may be accepted; follow Section 01 2500, Substitution Procedures.

#### 2.2 ACCEPTABLE MANUFACTURER

- A. Flygt - No Substitutions.
- B. Pumps shall be readily removable and replaceable without de-watering wet well or disconnecting any piping in wet well.

#### 2.3 PERFORMANCE AND DESIGN REQUIREMENTS

- A. See Schedule in PART 3.

#### 2.4 PUMP MATERIALS

- A. Provide pumps that are NRTL listed to UL 778 *Motor Operated Water Pumps*.

- B. Volute, impeller, motor housing, discharge elbow, and other components: Gray cast iron, ANSI Class 30.
- C. Shaft: Stainless steel or carbon steel.
- D. Motor:
  - 1. Rotor bars and short circuit rings: Aluminum.
  - 2. Windings: Copper.
  - 3. Stator winding and lead insulation: NEMA Class F.
- E. Mechanical Seals:
  - 1. Lower: Tungsten carbide/tungsten carbide.
  - 2. Upper: Tungsten carbide/carbon.
- F. Wear Ring:
  - 1. Case wear ring: Steel with molded nitrile rubber.
  - 2. Impeller wear ring: ANSI 304 stainless steel. Provide on pump greater than 15 HP.
- G. Exposed Nuts and Bolts: ANSI 304 stainless steel.

## 2.5 PUMP CONSTRUCTION

- A. Water Tight Sealings: Nitrile rubber O-rings against machined surfaces.
- B. Cable Entry Design:
  - 1. Seal: Torque-free mechanical compression type with strain relief. Do not use epoxies, silicones, or other secondary sealing. Submersible cable entry shall be field replaceable without replacing cable.
  - 2. Seal junction chamber from motor by terminal board and an elastomer compression seal.
- C. Pump Motor:
  - 1. Squirrel cage induction type, housed in air-filled watertight chamber.
  - 2. Dip and bake stator three times in NEMA Class F varnish and heat shrink fit into the stator housing. Do not use designs requiring penetration of stator housing.
  - 3. Motor cooling system:
    - a. Thermal radiators integrally cast into stator housing, up to 10.5 HP.

- b. Circulation of pumped media through a cooling jacket for 15 HP and larger.
- D. Pump Shaft Bearings:
  - 1. Permanently lubricated ball bearings.
    - a. Upper Bearing: Single row deep groove.
    - b. Lower Bearing: Two-row angular contact.
  - 2. Sealed completely from pump liquid.
- E. Minimum B10 Bearing Life: 20,000 elapsed-time hours at any point on head-capacity curve.
- F. Mechanical Seals: Tandem independent and run in a standard motor oil reservoir.
- G. Impeller: Dynamically balanced, double shrouded, non-clog, single vane capable of handling 3 inch diameter solids, unless otherwise scheduled.
- H. Equip each pump with stainless steel lifting chain and submersible pump cable.
- I. Provide sliding guide bar bracket unit to guide on at least two rails which is an integral part of pump unit. Do not permit any portion of the pump or guidance system to bear on sump floor. Do not use guide cables.
- J. Provide metal-to-metal discharge pump/elbow connection seal. Do not use diaphragm or O-ring type seals.

## 2.6 PERFORMANCE

- A. Pump motor:
  - 1. 3 phase motor.
  - 2. Non-overloading throughout pump curve.
  - 3. Capable of 15 evenly spaced starts per hour.
  - 4. Capable of running dry indefinitely without damage.
  - 5. Motor shall be rated for the site elevation.

## 2.7 PROTECTIVE COATING

- A. Pump Exterior: PVC epoxy primer and chloric rubber paint finish.
- B. Impeller: PVC epoxy or Rislant.

## 2.8 ACCESSORIES

- A. Pump accessories supplied by pump manufacturer.
- B. Provide pump accessories required for proper installation and/or as recommended by manufacturer, including the following.
  - 1. Upper and intermediate guide bar brackets with stainless steel nuts and bolts.
  - 2. Stainless steel guide rails and brackets with stainless steel nuts and bolts.
  - 3. Stainless steel lift chain.
  - 4. Safety chain hook.
  - 5. Cable holder for pump cable and float cable.
  - 6. Cable support grip.
  - 7. Anchorage.
  - 8. Cable rack for high level float.
  - 9. Self-weighted float switch, Flygt Model ENH-10.
  - 10. Check valve, flanged ends, line size, Flygt Model HDL 5087.
  - 11. Plug valve, eccentric, flanged ends, line size, BUNA packing, neoprene plug facings, lever handle, DeZuric series 100, Fig. No. 118.
  - 12. Standard discharge connection.
  - 13. Wet Well: Aluminum access frame and cover, single door with spring assist, 48 inches x 36 inches, with stainless steel hinges and accessories, locking mechanism to accept a Best brand government padlock, and hinged safety grating built-in.
  - 14. Dry Well: Aluminum access frame and cover, single door, 36 inches x 36 inches, with stainless steel hinges and accessories, and locking mechanism to accept a Best brand government padlock.
  - 15. Transducer Containment Fittings:
    - a. 8 x 6 inch PVC Schedule 40 reducer coupling.
    - b. 8 inch PVC Schedule 40 cap.
    - c. 8 inch Schedule 40 pipe.
- C. Controls:
  - 1. RACO Verbatium – No substitute, including the following.

- a. Enclosure – NEMA 4X.
  - b. Environmental – Heater.
  - c. Local alarm relay output.
- 2. Milltronics Hydro-Ranger 200, Part No. 7ML1034 - 1AA1 with Echomax XPS-10 transducer, Part No. 7ML1115 - 0CA31.
  - 3. NEMA 4X enclosure box for mounting of RACO Verbatium outside of, but attached to, motor control center. Provide connections in motor control center for RACO Verbatium unit.
  - 4. Telephone line grounding/terminator box, Hoffman No. A-1086CHQRFG, with 1/2 inch plywood backing plate mounted inside. Mount box beside and connect to the RACO Verbatium box with 3/4 inch conduit nipple.
  - 5. RACO Verbatium enclosure and backplate, Hoffman No. A-201608LP and No. A-20P16.
- D. Standby Generator Connections:
- 1. Furnish means to connect the lift station motor control panel to a portable standby generator; meet the requirements of National Electrical Code Article 702.
  - 2. Provide a double-throw fusible safety switch that will serve as a manual transfer switch to connect the lift station to either utility power or a standby generator.
    - a. Switch shall be rated 100 amperes, 480 volts and shall include two mechanically interlocked fusible switches in a NEMA 3R enclosure. Rating shall be equal to or greater than the circuit feeder.
    - b. Provide switch with an external operating handle that can be padlocked in either position.
    - c. Switch must be NRTL-listed to UL 98 *Enclosed and Dead Front Switches* and NRTL-listed for use as service entrance equipment.
    - d. Manufacturer: Square D, Cutler-Hammer, Westinghouse
    - e. Provide six Class R 100 ampere dual-element time-delay fuses and six spare fuses.
    - f. Switch shall be installed on the circuit feeder before the controller and connected to the input terminal lugs.
  - 3. Provide watertight pin and sleeve power inlet device and matching connector body for connecting the generator to the double-throw safety switch.

- a. Devices must be NRTL-listed to International Standards IEC 309-1 and 309-2.
- b. Provide devices rated for 100 amperes, 480 Vac, 3-phase, 4-wire; the fourth wire is the equipment grounding conductor.
- c. Provide closure caps for inlet device and connector body.
- d. Provide metallic angle back box for the inlet device.
- e. Manufacturer: Hubbell HBL4100B7W inlet, HBL4100C7W connector, BB1002W back box, PC100 closure caps.

## 2.9 MOTOR CONTROL CENTER

- A. Provide motor center panel that is NRTL listed to UL 508 Industrial Control Equipment. Where directly connected to electrical utility service, provide motor control panel that is NRTL-labeled for service entrance use.
- B. Duplex pump control panel supplied by pump supplier.
  - 1. Manufacturer: E.G. Pumps Controls.
- C. Provide duplex pump controls required for proper installation and/or as recommended by manufacturer including the following:
  - 1. If MCC is required provide it with separate cubicle to accommodate Milltronics unit with glass view port on door.
  - 2. Two pump Circuit Breakers: UL interrupting rating not less than 14,000 amperes RMS symmetrical at 480 volts or 22,000 amperes RMS symmetrical at 240 volts.
  - 3. Two NEMA rated, full voltage non-reversing motor starters.
  - 4. Duplex Logic Chassis (an anodized aluminum sub-assembly) with Logic Panel Including:
    - a. Two Hand-Off-Auto selector switches.
    - b. Two run pilot lights (red).
    - c. Two off pilot lights (green).
    - d. Level alarm pilot light.
    - e. Alarm silence pushbutton.
    - f. Motor over temperature sensor – shut pump down.
    - g. LED status indication pilot lights for each relay function.

- h. GFCI duplex convenience receptacle. Mount inside on front plate.
- 5. Space heater to prevent condensation within the enclosure.
- 6. Ground lugs for pump and service connections.
- 7. Enclosure NEMA 3R.
- 8. Additional control breaker - 15 amp, 1 pole.
- 9. Control power transformer - 2 KVA, 16.7 amps.
- 10. Phase Monitor Relay, 200-240 volt or 440-480 volt, 3 phase as required; capable of detecting loss of a single phase, under-voltage, over voltage, and voltage unbalance. Alarm will be sent to the RACO Verbatium unit.
- 11. Lightning surge arrestor.
- 12. Elapsed time meter for each pump.
- 13. Lag pump time delay relay.
- 14. Seal failure relay, Flygt, with pilot light.
- 15. Audible Alarm horn, 93 dB at 20 feet.
- 16. Alarm beacon with flasher.
- 17. Alarm memory circuit to maintain alarm beacon until manually reset.
- 18. Alarm and control enclosure.
- 19. Additional isolated dry contacts.
  - a. Motor over-temperature (2) - contact type form "C".
  - b. Motor overload trip (2) - contact type normally open.
  - c. Seal failure (2) - contact type form "C".
  - d. Power failure - contact type form "C".
- 20. High level float status light.
- 21. High level float test switch.
- 22. Local control panel disconnect. Mount beside, but exterior to, the control panel.
- 23. Main breaker.
- 24. Operating voltage sign and station name.

25. pH enclosure, Hoffman No. U-U504030.

## 2.10 POWER AND CONTROL CABLES

- A. Provide for all cables to connect between motor control center, motors, control devices, and electrical devices. Cables shall be based on the pump manufacturer's products and requirements.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Wet well and dry well shall be fabricated and installed by the LANL Standard Exterior Lift Station Drawings ST-G3020-2 and per LANL Specification 33 0513, Manholes and Structures.
  - 1. Wet well bottom and walls shall be coated with a two-part, high build epoxy lining. Material shall have chemical resistance and designed as a structural lining for manholes and vessels in wastewater facilities.
  - 2. Verify that surfaces and substrate conditions are ready to receive work as instructed by the product manufacturer before applying lining.
  - 3. Apply products in accordance with manufacturer's instructions.
  - 4. Material will be 100% solids by volume.
  - 5. Manufacturer: Raven Lining Systems.
- B. Install pumps and equipment in accordance with manufacturer's instructions, Contract Drawings and LANL Standard Drawings ST-G3020-2.
- C. Install pumps level, plumb, accurately aligned, with leak-proof pump connection, and easily removed without entering wet well.
- D. Provide vehicle accessible, level, all-weather surface adjacent to control panel that is suitable for positioning a trailer-mounted engine-generator.
- E. Install all electrical equipment and electrical boxes outside of lift station pit except for the transducer that is installed by LANL's Support Services Subcontractor (SSS).
  - 1. Install Millitronics Hydro-Ranger in electrical motor control center.
  - 2. Adjust settings as directed by LANL's SSS.
- F. Make no splices in cable.
- G. Furnish and install all power connections to and from the control box in accordance with provisions of Division 16.
- H. Provide communications link between the lift station monitoring/controls and the

TA-46 Wastewater Plant PLC system. System shall be installed and available for testing during the Acceptance Inspection.

### 3.2 HIGH LEVEL FLOAT

- A. Suspend on bracket as shown on Drawings.
- B. Make no splices in cable.
- C. Adjust float level as directed by LANL's Support Services Subcontractor (Utilities).

### 3.3 MANUFACTURER'S ON-SITE SERVICE

- A. Arrange for a factory trained service engineer to be present to check installation and operation.
- B. Arrange for a factory trained service engineer to provide a minimum of 4 hours per pump station of training to operating personnel on operation and maintenance of pumping equipment.
- C. Provide a report by the service engineer certifying that equipment has been installed and is operating correctly.

### 3.4 LANL ACCEPTANCE INSPECTION, TESTING, ADJUSTING, AND TIE-IN

- A. LANL Construction Inspector will contact LANL's Utility Group Wastewater Representative at least 10 working days in advance to have LANL's Support Services Subcontractor (Utilities) perform the following:
  - 1. Video inspection of gravity and force main sewer lines.
  - 2. Inspection, testing, and adjusting of alarms and controls on lift station.
  - 3. Inspection of lift station for compliance with drawings and specifications.
  - 4. Tie-ins to existing sanitary sewer system.
- B. LANL Construction Inspector will ensure that an approved WPF (Waste Profile Form) for all anticipated wastewater from all drains or buildings connected to the sanitary wastewater system has been completed by LANL Projects Manager and on file before scheduling tie-ins. Documentation shall be submitted to the LANL Utility Group wastewater representative prior to utility tie-in.  
<http://enterprise.lanl.gov/forms/1346.pdf>
- C. Schedule electrical inspection by the LANL Electrical Authority Having Jurisdiction (AHJ). Do not connect equipment to electrical service until the work has been inspected and approved by the AHJ.

### 3.5 IDENTIFICATION

- A. Install component identification, voltage warning labels, and arc-flash warning

labels on motor control center [and manual transfer switch].

- B. Install placard at generator power inlet indicating phase rotation.
- C. Refer to Section 26 0553 Identification for Electrical Systems.

### 3.6 EQUIPMENT SCHEDULE

- A. Flygt Model [ ] with Impeller Model [ ].
  - 1. GPM/TDH (feet): [ ]
  - 2. HP: [ ]
  - 3. Discharge Pipe (inches): [ ]
  - 4. RPM: [ ]
  - 5. Volts/Phase: [ ]
  - 6. Max motor Input at design point (KW):[ ]
- B. Site elevation: 7500 feet.

END OF SECTION

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Do not delete the following reference information:

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FOR LANL USE ONLY

This project specification is based on LANL Master Specification 33 3200 Rev. 1, dated March 24, 2006.